PB-218 567

# EVALUATION OF STA-POWER FUEL ADDITIVE

Henry L. Gompf

Environmental Protection Agency
Ann Arbor, Michigan

February 1972

DISTRIBUTED BY:

NTIS

National Technical Information Service
U. S. DEPARTMENT OF COMMERCE
5285 Port Royal Road, Springfield Va. 22151

PB 218 567 72-16

APTD-1400

# EVALUATION OF STA-POWER FUEL ADDITIVE

February 1972

Reproduced by
NATIONAL TECHNICAL
INFORMATION SERVICE
U S Department of Commerce
Springfield VA 22151

Henry L. Gompf
Test and Evaluation Branch
Environmental Protection Agency

G R

| BIBLIOGRAPHIC DATA SHEET | 1. Report No. APTD-1400 | 2. | 3. Recipient's Accession No. PB-218 567 |
|---|---|---|---|
| 4. Title and Subtitle<br>Evaluation of Sta-Power Fuel Additive | | | 5. Report Date<br>February 1972<br>6. |
| 7. Author(s)<br>Henry L. Gompf | | | 8. Performing Organization Rept. No. |
| 9. Performing Organization Name and Address<br>ENVIRONMENTAL PROTECTION AGENCY<br>Test and Evaluation Branch<br>Ann Arbor, Michigan | | | 10. Project/Task/Work Unit No.<br>11. Contract/Grant No. |
| 12. Sponsoring Organization Name and Address<br>Same | | | 13. Type of Report & Period Covered<br>Inhouse<br>14. |

15. Supplementary Notes

16. Abstracts

Sta-Power fuel additive is being marketed as an emission reduction compound when mixed in the specified proportions with gasoline. It was desired to determine whether there was an immediate effect on emissions. An immediate effect would indicate that Sta-Power effects the chemical properties of the fuel or the reactions in the combustion process. A 1970 Plymouth Valiant with a 225 CID six cylinder engine was used for the emission testing. Baseline, and additive tests were run using the 1968 Federal Emission Test Procedures. Continuous emission measuring was used, values being calculated according to the 1968 Federal Emission Test Procedure. The test data indicate that Sta-Power has no immediate chemical or combustion effect which results in an emission reduction. No evaluation of long term detergent effect was made.

17. Key Words and Document Analysis. 17a. Descriptors

Air pollution
Exhaust emissions
Automobiles
Fuel additives
Tests
Standards
Hydrocarbon
Carbon monoxide
Carbon dioxide
Nitrogen oxides

17b. Identifiers/Open-Ended Terms

Sta-Power fuel additive

17c. COSATI Field/Group 13B

| 18. Availability Statement | 19. Security Class (This Report) | 21. No. of Pages |
|---|---|---|
| Unlimited | UNCLASSIFIED | 7 |
| | 20. Security Class (This Page) UNCLASSIFIED | 22. Price $3.00 |

## Background

Sta-Power fuel additive is being marketed as an emission reduction compound when mixed in the specified proportions with gasoline. While it is assumed that its intended effect is a detergent one, it was desired to determine whether there was an immediate effect on emissions. An immediate effect would indicate that Sta-Power effects the chemical properties of the fuel or the reactions in the combustion process. No attempt to measure the results of its detergent action was made. The extent of any reduction of emissions with long term use of Sta-Power would be dependent on the condition of carburetor and engine parts.

## Control Technique

Sta-Power is a petroleum based product marketed by the Sta-Power Company of San Rafael, California. It is added to the fuel tank at a rate of one ounce of Sta-Power per gallon of gasoline.

## Test Program

A 1970 Plymouth Valiant with a 225 CID six cylinder engine was used for the emission testing. The car was operated on the chassis dynamometer at 50 miles per hour to allow the engine to reach normal operating temperatures. Baseline 7-mode cycles (as used for the 1968 Federal Emission Test Procedures) were run using Indolene 30 test fuel. At completion of the baseline cycles the vehicle was allowed to run out of fuel. The vehicle was then run several minutes using a mixture of Indolene 30 and Sta-Power. Two more 7-mode cycles were run followed by fuel runout. Finally two more cycles were run with pure Indolene 30.

For the baseline and additive tests, continuous emission measuring was used. Emission values were calculated according to the 1968 Federal Emission Test Procedure. NDIR instrumentation was used to measure hydrocarbon, carbon monoxide, carbon dioxode, and nitric oxide emissions from the vehicle tailpipe. A hot start test was employed to eliminate cold start variability which might have masked any additive effect. Continuous tailpipe analysis enabled comparison of the additive's effect on each engine operating mode.

## Results

The modal analysis data is presented in the Appendix. The effect on Sta-Power is summarized in the following table:

ffect of Sta-Power from Baseline

| Mode | HC | CO | NO |
|---|---|---|---|
| Idle | no effect | no effect | no effect |
| 0-25 Accel | no effect | slight red. | no effect |
| 30 Cruise | slight inc. | slight inc. | slight red. |
| 30-15 Decel | no effect | no effect | slight red. |
| 15 Cruise | no effect | slight inc. | reduction |
| 15-30 Cruise | no effect | no effect | slight inc. |
| 50-20 Decel | slight red. | no effect | no effect |

Hot 7-mode Cycles
Weighted & Averaged

| | HC | CO | NO |
|---|---|---|---|
| Baseline | 133.7 ppm | .57% | 1425.2 ppm |
| Sta-Power | 132.8 ppm | .57% | 1447.5 ppm |

As can be seen, no significant effect on Sta-Power was measured.

## Conclusions

Sta-Power has no immediate chemical or combustion effect which results in an emission reduction. No evaluation of long term detergent effect was made.

# APPENDIX

## MODE-BY-MODE STA-POWER ADDITIVE ANALYSIS

| | | Pre-Baseline Average | Sta-Power Average | Post-Baseline Average |
|---|---|---|---|---|
| IDLE | | | | |
| | HC | 118.7 ppm | 113.4 ppm | 109.1 ppm |
| | CO | 1.89% | 1.72% | 1.59% |
| | $CO_2$ | 12.46% | 12.63% | 12.66% |
| | NO | 4.5 ppm | 4.5 ppm | 4.5 ppm |
| 0-25 ACCEL | | | | |
| | HC | 124.6 ppm | 118.9 ppm | 116.1 ppm |
| | CO | .51% | .38% | .42% |
| | $CO_2$ | 13.09% | 13.14% | 13.15% |
| | NO | 1320.9 ppm | 1427.1 ppm | 1528.5 ppm |
| 30 CRUISE | | | | |
| | HC | 102.3 ppm | 108.4 ppm | 97.3 ppm |
| | CO | .16% | .19% | .12% |
| | $CO_2$ | 13.36% | 13.85% | 13.51% |
| | NO | 1302.4 ppm | 944.9 ppm | 1196.5 ppm |
| 30-15 DECEL | | | | |
| | NO | 99.7 ppm | 95.7 ppm | 87.8 ppm |
| | CO | 1.59% | 1.53% | 1.26% |
| | $CO_2$ | 12.85% | 12.86% | 13.06% |
| | NO | 250.3 ppm | 221.4 ppm | 264.8 ppm |

| | Pre-Baseline Average | Sta-Power Average | Post-Baseline Average |
|---|---|---|---|
| **15 CRUISE** | | | |
| HC | 132.8 ppm | 120.2 ppm | 116.5 ppm |
| CO | 1.47% | 1.50% | 1.21% |
| $CO_2$ | 12.95% | 12.79% | 13.17% |
| NO | 11.3 ppm | 6.1 ppm | 39.5 ppm |
| **15-30 ACCEL** | | | |
| HC | 123.8 ppm | 120.0 ppm | 115.5 ppm |
| CO | .34% | .28% | .23% |
| $CO_2$ | 13.14% | 13.28% | 13.29% |
| NO | 1808.5 ppm | 1918.8 ppm | 1737.8 ppm |
| **50-20 DECEL** | | | |
| HC | 419.1 ppm | 408.4 ppm | 481.8 ppm |
| CO | 1.78% | 1.72% | 1.46% |
| $CO_2$ | 12.85% | 12.95% | 12.80% |
| NO | 379.0 ppm | 373.7 ppm | 322.9 ppm |
| **CYCLES WEIGHTED & AVERAGED** | | | |
| HC | 137.0 ppm | 132.8 ppm | 130.3 ppm |
| CO | .64% | .57% | .50% |
| $CO_2$ | | | |
| NO | 1425.3 ppm | 1447.5 ppm | 1425.0 ppm |